sierra monitor corporation

MODEL 5100-99-IT

IT Series

4-20 mA Transmitter

Version 2.0

APPLICABILITY & EFFECTIVITY

Effective for all Model 5100-99-IT-AL and 5100-99-IT-SS Transmitters manufactured after March 1, 2008

Instruction Manual Part Number T12005
Rev A

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1. PRODUCT DESCRIPTION

1.1 GENERAL

The Model 5100-99-IT Transmitter is a member of the ***Information Technology "IT"*** family of gas sensor transmitters.

IT transmitters offer a broad array of features, including:

- Integral alphanumeric LED display
- 4-20 mA output
- Modbus® RTU interface
- SMC Sentry interface
- 316 Stainless steel enclosure option
- Auxiliary integral relay option
- Remote display option
- Low maintenance and operation costs

The 5100-99-IT is designed and approved for installation and operation in hazardous locations.

1.2 PRODUCT CONFIGURATION

Various transmitter configuration options are available. Where applicable, these options are factory configured prior to shipment. Options which can be re-configured by the installer or field technician are fully described in this manual.

1.3 MODES OF OPERATION

1.3.1 SENTRY INTERFACE

IT gas sensor transmitter can be connected to on Sierra Monitor Sentry Model 5000 controllers. When it is connected to a Sentry system the IT transmitter must have a unique address which can be established by setting an address between 1 and 8 on the Transmitter Address Switch accessible from the cover plate as illustrated in Figure 3-1. Figure 3-6 in this manual provides the wiring terminations for connections to the Sentry controller.

When the transmitter is operated in conjunction with a Sentry controller, the alarms outputs in the transmitter can both be set to "Sentry", allowing the Sentry controller to manage alarm acknowledge and reset rather than the transmitter. The alarm relay outputs are triggered by the alarm values established in the transmitter and can be independent of the settings in the Sentry controller.

The Sentry configuration allows daisy chain installation using the Sentry multiplex capability, thus reducing costs by avoiding the requirement for wiring junction boxes. The connector card has two sets of connections, allowing for a continuous run to the next transmitter.

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1.3.2 MODBUS OPERATION

An RS-485 Modbus RTU serial interface allows direct connection to standard PLCs and DCSs. The Transmitter Address Switch (section 3.5) allows the user to select up to 16 different Modbus addresses. Also, an additional 238 Modbus addresses (for a total of 254 different Modbus Addresses) are available via menu selection. Figure 3-6 in this manual provides the wiring terminations for Modbus connections. The 5100-XX-IT provides the additional terminal connectors to enable the user to connect In/Out terminations of a RS-485 connection.

1.3.3 ANALOG OPERATION

The 4-20 mA interface allows direct connection to standard analog controllers or PLCs. The 5100-XX-IT 4-20 mA connection can be wired as a Type 3 (3-wire) or Type 4 (4-wire) circuit as described by ANSI/ISA-50.00.01-1975 Standard (see figure 3-5).

1.3.4 REMOTE ALARM RESET (DIGITAL INPUT) (Figure 3-7)

An input is available for connection of remote alarm reset/acknowledge. Figure 3-7 provides the wiring termination for connecting the remote alarm reset. This only resets local alarms, not Sentry alarms. This input can be wired as supervised or non-supervised.

Note that when the Remote Alarm Reset is operated in a supervised mode that both the switch and resistor must be present as outlined in Figure 3-7.

1.3.5 OPTIONAL INTEGRAL RELAYS

The optional relays are integral to the transmitter and are rated as SPDT, 250VAC, 8 Amps for the High Alarm and Low Alarm relays and SPDT, 250 VAC, 2 Amp for the Trouble relay.

If the transmitter is provided with the optional relays, it will include Terminal P4 on the interface board (Figure 3-2). Relay output connections are on P4.

1.3.6 MECHANICAL

The transmitter of comprised of the following three primary components:

1.3.7 ENCLOSURE

Standard on the 5100-99-IT-AL is an explosion-proof, rain-tight cast aluminum electrical housing (Figure 1-1) with three ¾" FNPT conduit hubs. The 5100-99-IT-SS (Figure 1-2) has a 316 Stainless Steel enclosure. Both enclosure covers have a viewing window. The design of the enclosures allows 3-way mounting choices as shown in figure 1-3.

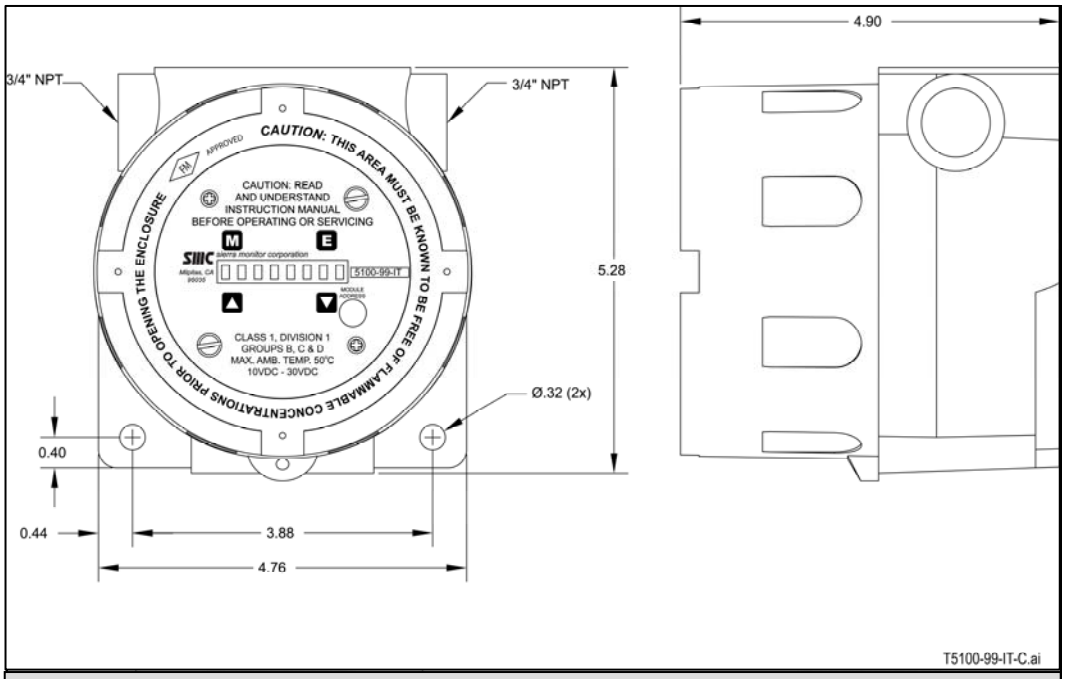
4.90
3/4" NPT
3/4" NPT
CAUTION: THIS AREA MUST BE KNOWN TO BE FREE OF FLAMMABLE CONCENTRATIONS PRIOR TO OPENING THE ENCLOSURE
CAUTION: READ AND UNDERSTAND INSTRUCTION MANUAL BEFORE OPERATING OR SERVICING
CLASS 1, DIVISION 1 GROUPS B, C & D MAX. AMB. TEMP. 50°C 10VDC - 30VDC
5100-99-IT
5.28
Ø.32 (2x)
0.40
0.44
3.88
4.76
T5100-99-IT-C.ai

Figure 1-1
Model 5100-99-IT-AL & SS Transmitter –
Aluminum & Stainless Steel Enclosure, Dimensions

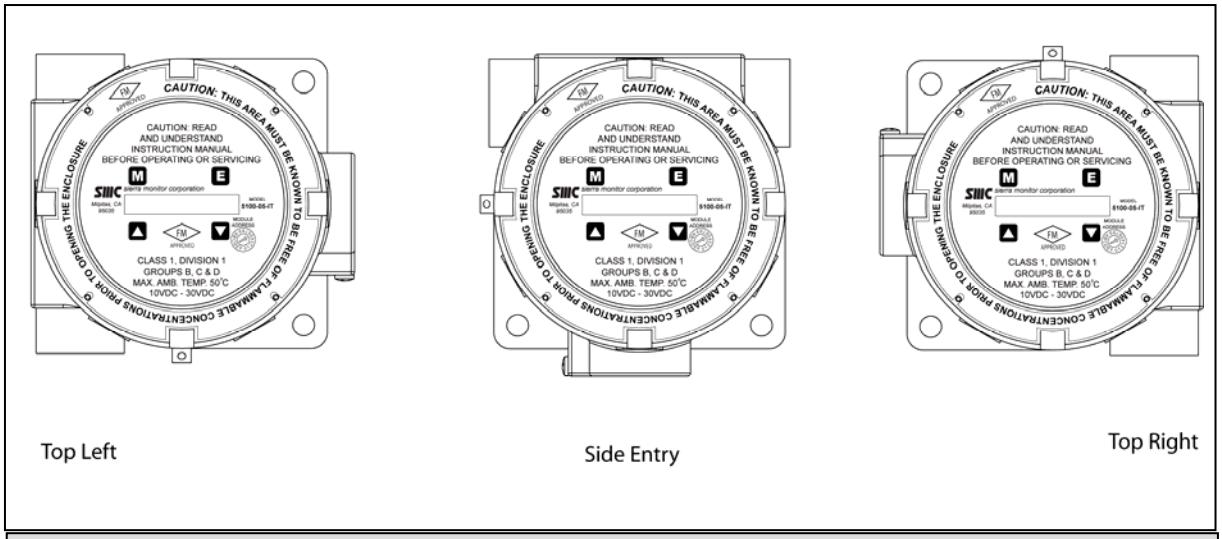

Figure 1-3
Model 5100-99-IT Transmitter – Mounting Options

1.3.8 TRANSMITTER ELECTRONICS

Electronic Assembly consist of one top transmitter board (connected to the cover plate) and a lower interface board. Connectors for wiring for power, signal interface and alarm relays are located on the interface board assembly

1.4 INTERCONNECT WIRING

Not supplied with the transmitter, but necessary to the installation and operation is the multi conductor wiring which connects the transmitter to its power source and controller. Before this wiring is installed it is important to read and understand the control system installation instructions to determine wiring requirements and alternatives.

1.5 POWER REQUIREMENTS

5100-99-IT operates on DC power between 10 VDC and 30 VDC. Regulated DC power must be supplied from a separate source, or from an approved Sentry or ***IT*** controller.

2. CAUTIONS & WARNINGS

2.1 INTRODUCTION

Although ***IT*** Transmitter is designed and constructed for installation and operation in industrial applications including "hostile" environments, caution should be taken to insure that the installation is made in compliance with this instruction manual and that certain procedures and conditions are avoided. This chapter discusses the necessary cautions. **Read the entire chapter prior to installation of the equipment.**

2.2 IT TRANSMITTERS - GENERAL

Avoid installing Transmitter where they will be unnecessarily exposed to wind, dust, water (esp. direct hose down), shock, or vibration. Observe temperature range limitations.

2.3 WIRING

The manufacturer recommends that extra caution be taken where the installation is near any sources of electromagnetic or radio frequency interference. Precautions include:

- Avoid running transmitter cable close to high power cables, radio transmission lines, or cables subject to pulses of high current.
- Avoid running cables near large electric motors or generators.
- When the transmitter is to be operated in analog (4-20mA output) mode shielded cable is required.
- All splices must be via either a termination hardware system or soldered. Improperly spliced cable can result in corrosion, resistance changes and system errors.
- Use low capacitance cable for RS-485 Modbus RTU Operation.

NOTE
Installation and wiring must be in accordance with the National Electrical Code. AC Voltage conductors are not to be run in the same conduit as DC voltage conductors.

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3. INSTALLATION

NOTE
All transmitters are factory are pre-configured and calibrated.
Identify all components during unpacking and install using the factory configuration.

3.1 TRANSMITTER LOCATIONS

Select locations for each transmitter so that they are placed in areas accessible for calibration.

3.2 WIRING

3.2.1 ANALOG 4-20 mA OPERATION

The 4-20 mA output for the 5100-99-IT can be either 3-wire or 4-wire operation. If using 3-wire operation, use a minimum of 18 AWG, shielded, 3-conductor cable up to 2000'. For 4-wire operation, use a minimum of 2 each, 18 AWG, twisted, shielded, pair up to 2000'.

3.2.2 MODBUS OPERATION USING RS-485 CONNECTION

Use a minimum of 18 AWG, 2 conductor for DC power connection. No shield required. In addition use a minimum of 24 AWG, low capacitance, shielded data cable for RS-485 half duplex communication. The installation may be planned in a manner which provides up to 32 sensor modules on a single home run.

Refer to Figure 3-3. Units ship with BIAS jumpers connected. For all installations, except very long cable runs, leave these jumpers connected. The TERM jumpers should be installed in the last (furthest) module of every loop.

3.2.3 SENTRY OPERATION USING SMC SENTRY CONNECTION

Wire shall be rated as 600 volt tray cable, such as Belden (or equivalent) 27331 or 27331 AS (shielded). If high RFI or EMI levels exist wiring should be protected by conduit or shield. The installation may be planned in a manner which provides up to 4 sensor modules on a single home run to a Sentry controller.

NOTE
Be sure to follow all local electric code and safety requirements when installing the 5100-99-IT Transmitter

3.2.4 GENERAL

Install conduit as required by local code or construction specifications. When transmitters are to be multiplexed for Sentry or RS-485 communication, two alternatives may be planned:

- Use multi-position positive contact terminals to connect daisy chain wiring and provide a pigtail to connect to the transmitter board.

NOTES
The drain wire of shielded cable must NOT be used as one of the conductors.
Installation and wiring must be in accordance with the National Electrical Code. Temperature rating of cable wire must be at least 75°C. If cable runs through higher temperature environments, it must be specified for that environment.

3.3 ENCLOSURE INSTALLATION

To protect the transmitter they should be removed from the enclosure and preserved until final installation and wiring termination.

Prior to installation and wiring:

1. Remove the transmitter from the module housing by:
   - Unscrew the two captive panel screws in the face plate.
   - Lift the transmitter out of the housing.
2. Install the module housing onto the end of the supply conduit and/or bolt into position as required.

NOTES
When housing earth grounding is required for the installation a grounding lug is located in the base of the enclosure. Install the earth ground wire under the green lug.

P1	PCB Label		Function
1	Switch	IN +	Digital Input SW +
2		IN -	Digital Input SW -
3	4-20	IN +	4-20 mA Input +
4		IN -	4-20 mA Input -
5	GND		Ground
6	4-20	OUT +	4-20 mA Output +
7		OUT -	4-20 mA Output -

P2	PCB Label		Function
1	RS 485	+	RS 485 (+) (A)
2		-	RS 485 (-) (B)
3		S	RS 485 shield (Isolated GND)
4	RS 485	+	RS 485 (+) (A)
5		-	RS 485 (-) (B)
6		S	RS 485 shield (Isolated GND)

P3B	PCB Label	Function
1	P	VDC Power
2	S	Sentry Signal or Communication
3	G	VDC Ground
P3A		
4	P	VDC Power
5	S	Sentry Signal or Communication
6	G	VDC Ground

P4 Connections are only available when the optional Relays are included

P4	PCB Label		Function
1	LO ALM	N/C	Low Alarm Relay NC
2		COM	Low Alarm Relay COM
3		N/O	Low Alarm Relay NO
4	HI ALM	N/C	High Alarm Relay NC
5		COM	High Alarm Relay COM
6		N/O	High Alarm Relay NO
7	TRBL ALM	N/C	Trouble Alarm Relay NC *
8		COM	Trouble Alarm Relay COM*
9		N/O	Trouble Alarm Relay NO*
* Trouble relay is fail safe so it is energized for normal operation, functions are labeled for normal operation.			

Table 3-1
Transmitter External Interfaces (See Figure 3-2)

1. Establish the module address according to section 3.5.

NOTES
The starting delay period normally takes approximately 3 minutes but it depends on the sensor connected.

3.4 TRANSMITTER ADDRESS SWITCH

For digital interface applications the module address switch (or Modbus node) Figure 3-1 must be set per Table 3-2:

POSITION	ADDRESS	POSITION	ADDRESS
1	Sensor 1	9	Sensor 09
2	Sensor 2	A	Sensor 10
3	Sensor 3	B	Sensor 11
4	Sensor 4	C	Sensor 12
5	Sensor 5	D	Sensor 13
6	Sensor 6	E	Sensor 14
7	Sensor 7	F	Sensor 15
8	Sensor 8	0	Software Menu

Table 3-2
Transmitter Address Switch Positions

NOTES

For Sentry applications only sensor addresses 1-8 are allowed. If using Modbus output sensor addresses 1-15 are available. Position 0 allows the Modbus Address to be set by software menu, in the range 16-254.

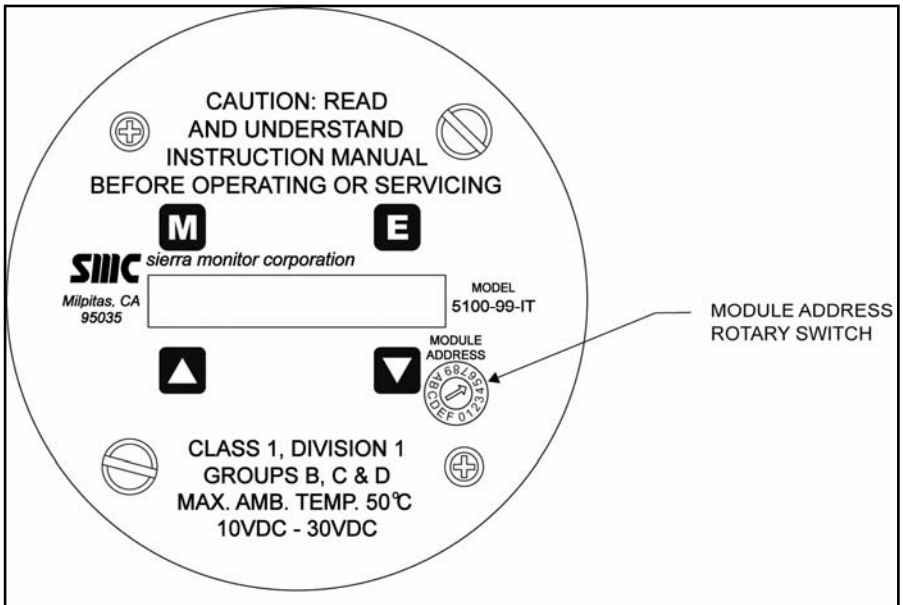


Figure 3-1
Transmitter Face Plate

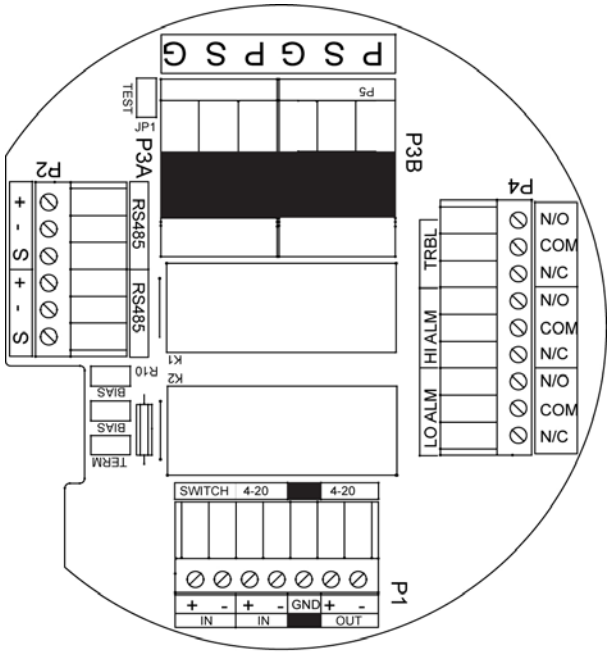


Figure 3-2
Interface Board Connectors

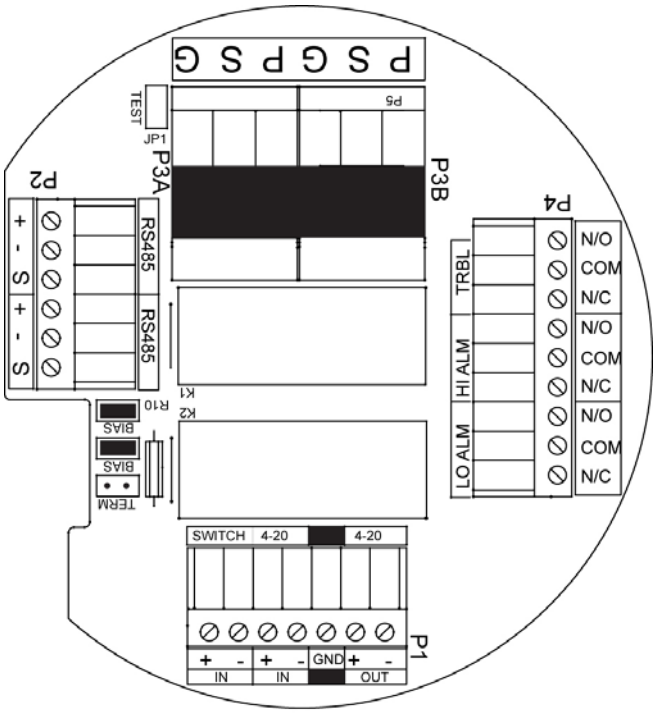


Figure 3-3
RS-485: Termination, BIAS Jumper

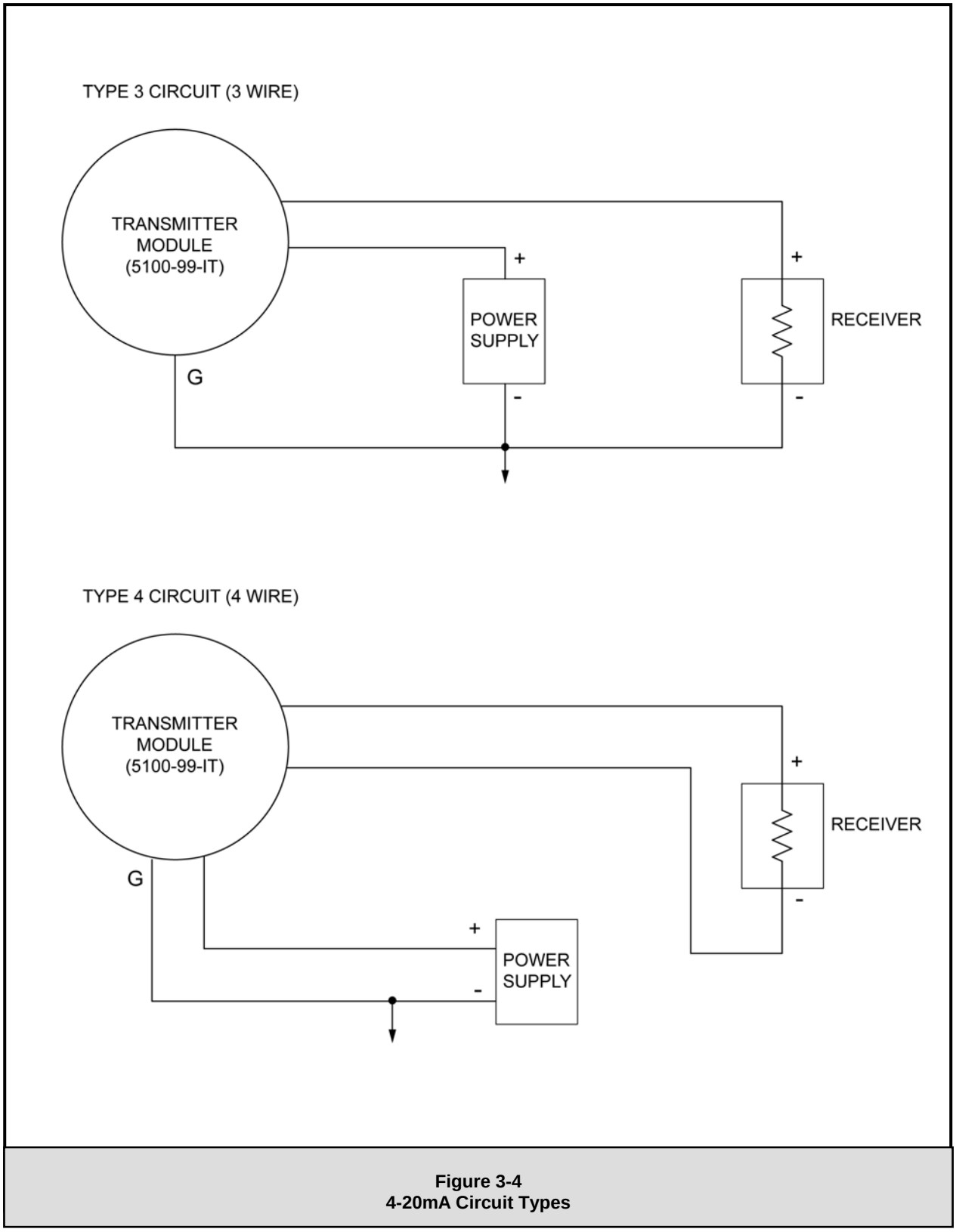
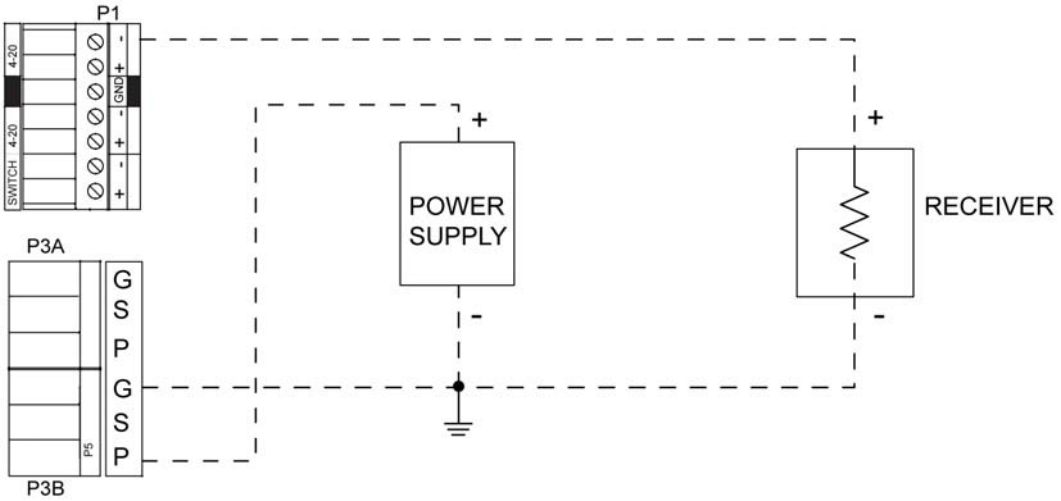


Figure 3-4
4-20mA Circuit Types

TYPE 3 CIRCUIT (3 WIRE)



TYPE 4 CIRCUIT (4 WIRE)

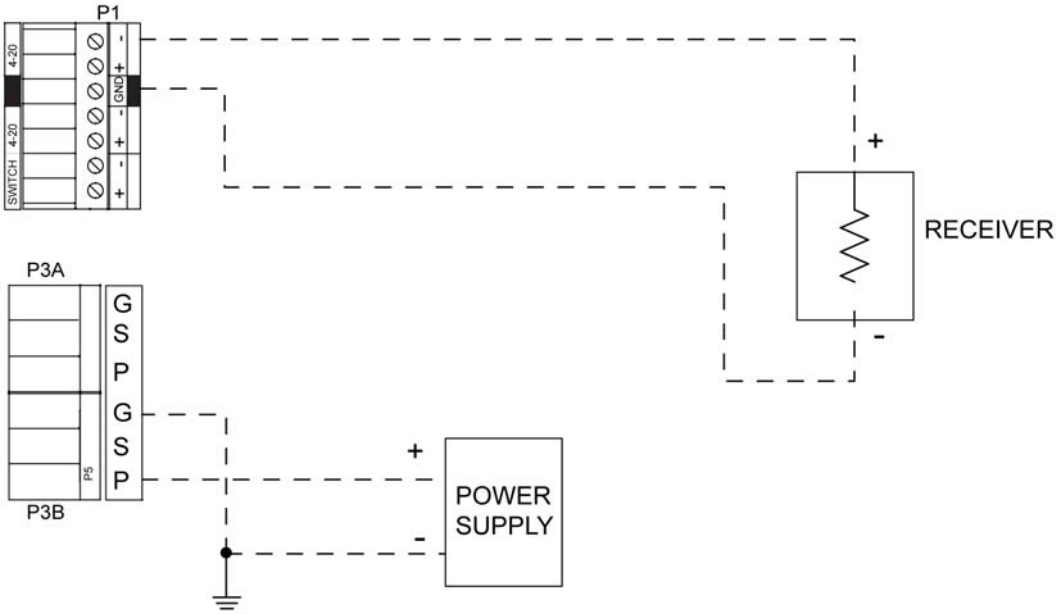
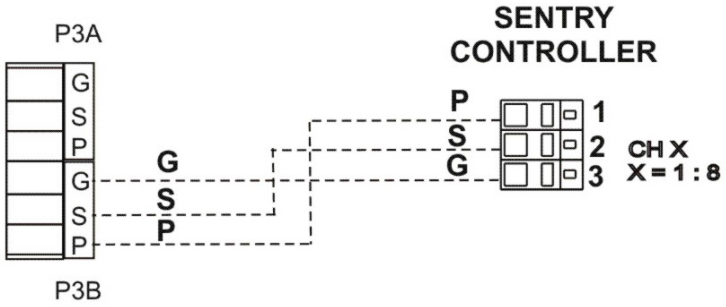
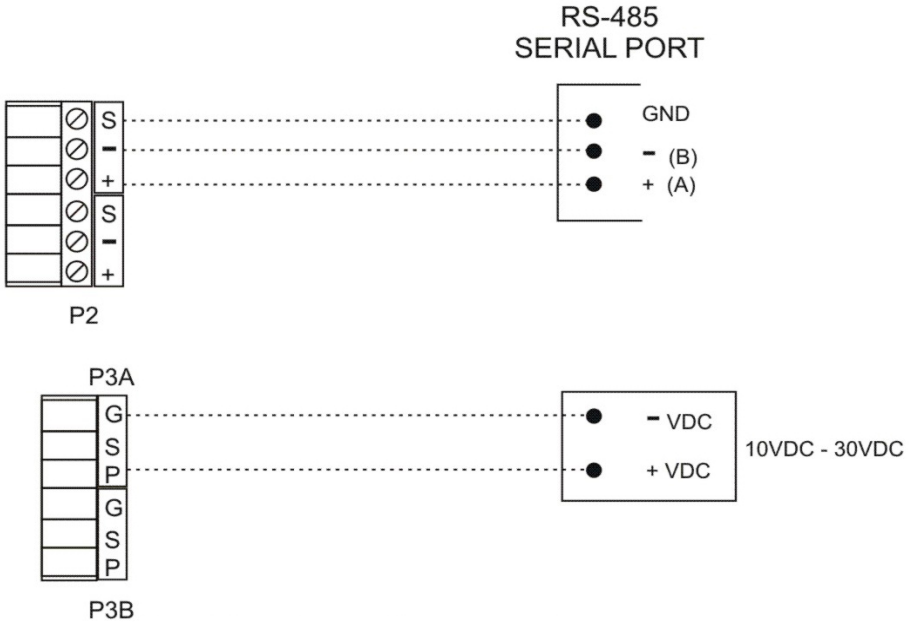


Figure 3-5
4-20mA Circuit Type Connections for 5100-99-IT

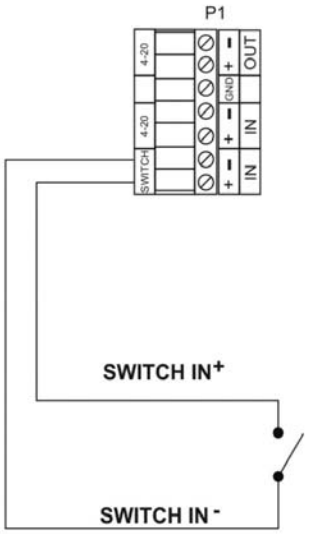


5100-99-IT TO SENTRY

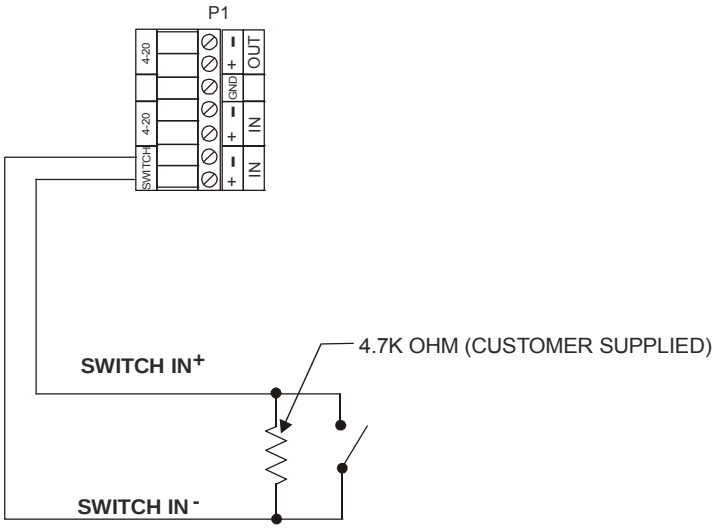


5100-99-IT TO MODBUS DEVICE

Figure 3-6
Wiring Connections for Modbus and Sentry Interface



5100-99-IT Remote Alarm Reset (Unsupervised)
(Dry contact only unpowered)



5100-99-IT Remote Alarm Reset (Supervised)

Figure 3-7
Wiring Connections for Remote Alarm Reset

4. OPERATION

4.1 INTRODUCTION – HUMAN-MACHINE INTERFACE SYSTEM

The transmitter utilizes a visual menu system operated by means of a magnet. A magnetic tool (5358-50) is supplied for this purpose. The menu system is used to configure alarm set-points, calibrate the transmitter, and for maintenance procedures and alarms acknowledge.

4.2 HUMAN-MACHINE INTERFACE

The transmitter menu system is operated by means of directing the magnet stick toward each of four independent hall-effect magnetic switches. The enclosure lid should remain on the unit. Each switch functions as if it is a manually activated panel key. The keys are located above and below the faceplate display and are labeled [M], [E], [▲] and [▼] as shown in Figure 4-1. The key functions are as follows:

- Key [M]: **MODE**
- Key [E]: **ENTER**
- Key [▲]: **UP** (+)
- Key [▼]: **DOWN** (-)

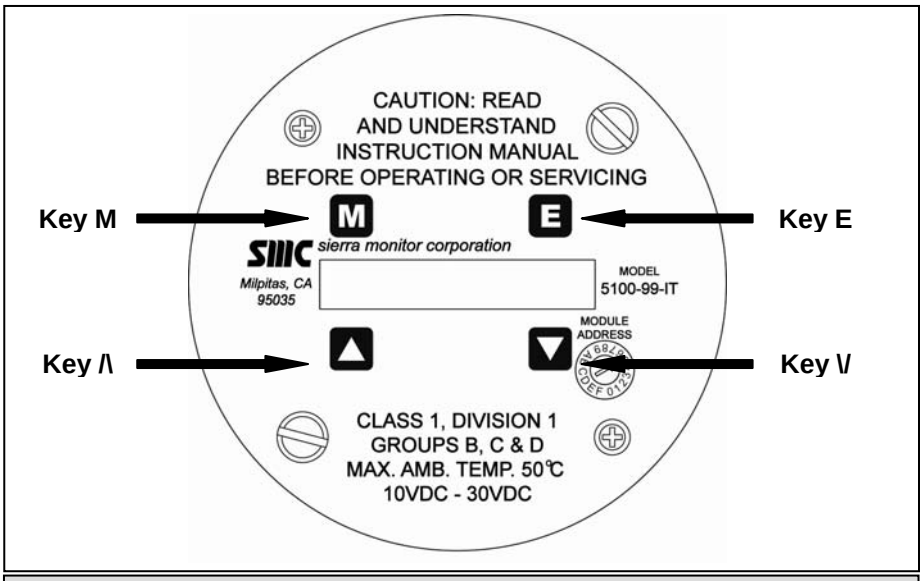


Figure 4-1:

***IT* Transmitter – Menu Switch Locations**

4.3 MAIN MENU

Table 4-1 describes the primary man-machine interface operation (The blackened box is the selected menu function).

Key	Function	Display	Description	Reference
M E ▲ ▼	Mode		Switch [M]	
M E ▲ ▼	Enter		Switch [E]	
M E ▲ ▼	Up		Switch [▲] Previous Menu	
M E ▲ ▼	Down		Switch [▼] Next Menu	
		5100-99	First screen at power up: Model No.	
		VXX-XX--	Second screen at power up: Version No.	
		START XX	Third screen at start up: Start Count Up	
		XXX PPM	Normal condition - default display	
M E ▲ ▼	Mode	ALMRSET:	Mode Function - Alarm Reset	
			Banner: "Press [E] to reset alarm"	
M E ▲ ▼		RESET	Alarm Reset	
		XXX PPM	Default Display	
M E ▲ ▼	Mode	ALMRSET:	Mode Function - Alarm Reset	
M E ▲ ▼	Mode	CALIB:--	Mode Function - Calibrate	Table 5-1
M E ▲ ▼	Mode	SETUP:--	Mode Function - Set Point Adjustments	Table 4-3
M E ▲ ▼	Mode	MAINT:--	Mode Function - Maintenance	Table 4-4
M E ▲ ▼	Mode	EXIT-?--	Exit Menu	
M E ▲ ▼	Enter	XXX PPM	Apply Selected Mode (Exit)	
		XXX PPM	Default Display (Once a minute the sensor displays module address)	

Table 4-1 Master Menu

Table 4-2 describes the operational display values of the human-machine interface system.

DISPLAY	DESCRIPTION
START	Delay from loss of power at start-up
XXX PPM	Concentration
LXXX PPM	Low Alarm
HXXX PPM	High Alarm
_HIGH__	Measures gas, concentration exceeds 100% of Full Scale
CXXX PPM	Calibration Mode
__ACK__	Acknowledged Function

Table 4-2 Operation Display Values

4.4 CONFIGURE SET-POINTS

The transmitter set-points menu is used to initially set-up the alarm set points, relay actions, range, 4-20 mA action and RS-485/Sentry address and baud rates.

- **Alarm Set-points:** Once the Set-up menu is selected, press [E] to activate the Alarm Set-point screen. Use the [▲] or [▼] keys to select Low Alarm or High Alarm menu. Key [▲] will adjust the setpoint upwards and Key [▼] will adjust the value downwards. Once it reaches the desired setpoint, Key [E] will accept it and ACK will appear.

- **Alarm Relay Set-up:** Once the Set-up menu is selected, press key [▼] once and press [E] to activate the Relay Set-up menu. Use the [▲] or [▼] keys to select High Alarm or Low Alarm relay menu and press [E]. Use the [▲] or [▼] keys to select the correct alarm relay action for the application, Latch, Sentry or Non-Latch. Selecting "Sentry" enables the Sentry controller to make all alarm action decisions. * indicates the current selection.

- **Range:** Once the Set-up menu is selected, press key [▼] twice and press [E] to activate the Range Set-up menu. Use the [▲] or [▼] keys to select Range menu and press [E]. When "Range" is selected menu provides any choices of ranges available for the gas type selected. Use the [▲] or [▼] keys to select the desired range. If the "User" range is selected, use the [▲] or [▼] keys to adjust the high end of the range desired. See specifications (page 25) for optional ranges.

- **4-20mA:** Once the Set-up menu is selected, press key [▼] three times and press [E] to activate the 4-20mA Set-up menu. Use the [▲] or [▼] keys to select Calib or CalibOut menu and press [E]. The "Calib" section of the menu allows the user to calibrate the 4 mA and 20 mA outputs. To calibrate the 4 mA and 20 mA outputs it is necessary to have an amp meter connected to the 5100-XX-IT and upon selecting the 4 mA output calibration then the [▲] or [▼] keys can be used to adjust the 4 mA reading on the amp meter until it reads 4 mA. Similar steps can then be performed for the 20 mA output. The CalibOut section allows the user to select the 4-20 mA output action desired during calibration. * indicates the current selected value. Available selections include:
  - **Track –** the 4-20mA value tracks the calibration gas exposed to the transmitter
  - **Zero –** the 4-20mA value is held at 0mA during calibration
  - **C1.50mA** – the 4-20mA value is held at 1.50mA during calibration
  - **C4.00mA** – the 4-20mA value is held at 4.0mA during calibration.
  - **TblOut** – the TblOut menu allos user to select 2.5 mA or A user selected value for Trouble mA signal.
  - **DigInput** – the DigInput menu allows user to select supervised or non-supervised input
  - **WarmMin** – the WarmMin menu allows user to select warm up time in minutes.

- **RS-485** - Once the Set-up menu is selected, press key [▼] four times and press [E] to activate the RS-485/Sentry Set-up menu. Use the [▲] or [▼] keys to select "Mode" or "Calib" menu and press [E]. The "Mode" menu allows the user to select units including %LEL, % Vol, PPM % Full Scale, or NA. The "Calib" section of the menu allows the user to calibrate the 4 mA and 20 mA outputs and inputs. Note that the 5100-99-IT has a rotary switch on the faceplate and it is used to select addresses 1-15. When connected to Sentry the user can select 1-8 and when using Modbus RS-485 the user can select addresses 1-15. For Modbus addresses above 15, set the rotary switch to 0 and then use the "Address" menu to select any address between 16 and 254. The Baud rate menu allows the user to select a baud rate of 38400, 19200, 9600, 4800 or 2400. * indicates current selection. Sentry default is 9600.

Key	Function	Display	Description	Reference
		--0%LEL-	Default Display	
M E ▲ ▼	Mode	ALMRSET:	Mode Function - Alarm Reset	
M E ▲ ▼	Mode	CALIB:--	Mode Function - Calibrate	
M E ▲ ▼	Mode	SETUP:---	Mode Function - Set Point Adjustments	
M E ▲ ▼	Enter	Alarms	S.P. Function - Alarm Adjust	* A Below
M E ▲ ▼	Down	Relays	S.P. Function - Relays Adjust	* B Below
M E ▲ ▼	Down	Relays	S.P. Function - Range Adjust	* Page 19
M E ▲ ▼	Down	4-20mA	S.P. Function - 4-20 mA Adjust	* Page 19
M E ▲ ▼	Down	Dig Input	S.P. Function - RS-485/Sentry Output Adjust	* Page 19
High Alarm Set Point Adjustment Example				
M E ▲ ▼	Enter	H.Alarm	S.P. Function - High Alarm Adjust	*A
M E ▲ ▼	Enter	HASP:40-	High Alarm Set Point: current = 40	
			Use ▲ or ▼ keys to adjust to new set point	
M E ▲ ▼	Down (x5)	HASP:55-	High Alarm Set Point: new = 55	
M E ▲ ▼	Enter	ACK	Momentary Acknowledge of new Set Point	
		H.Alarm	S.P. Function - High Alarm Adjust	
Relays Set Point Adjustment Example				
M E ▲ ▼	Enter	H. Relay	S.P. Function - High Alarm Relay Adjust	*B
M E ▲ ▼	Down	L.Relay	S.P. Function - Low Alarm Relay Adjust	
M E ▲ ▼	Enter	Latch	Use ▲ or ▼ keys to adjust to new relay action (Latch, Sentry, NonLatc) * indicates current	
M E ▲ ▼	Down	Sentry	NOTE: Sentry indicates that Sentry controls relay action and not the IT Sensor Module	
M E ▲ ▼	Down	*Sentry	Low Alarm Relay set to Sentry	

Table 4-3A Set-Up Configuration

Range Adjustment Example				
M E ▲ ▼	Enter	Range	S.P. Function - Range Adjust	*C
M E ▲ ▼	Enter	*100 PPM	Select [E] to select or ▲ or ▼ to select another and press [E]	
M E ▲ ▼	Down	10 PPM	Press [E] if selecting 0-10 PPM range	
M E ▲ ▼	Down	USER	Press [E] if selecting User adjustable range	
M E ▲ ▼	Enter	100 PPM	Select [E] to select or ▲ or ▼ to select another and press [E]	
4-20 mA Adjustment Example				
M E ▲ ▼	Enter	Mode	S.P. Function - Output Units Adjust	*D
M E ▲ ▼	Enter	%LEL	Use ▲ or ▼ keys to select units of output as %LEL, %Vol, PPM, %F.S. or mA	
			Use ▲ or ▼ to select for 4 mA output, 20 mA output, 4 mA input or 20 mA input	
M E ▲ ▼	Down	Calib	S.P. Function - 4-20 mA Calib Adjust	*D
M E ▲ ▼	Enter	Out: 4mA	Use [E] to calibrate analog output, adjust output level with ▲ or ▼ then press [E] when done	*D
			Use ▲ or ▼ to select for 4 mA output, 20 mA output, 4 mA input or 20 mA input	
M E ▲ ▼	Enter	4mA	Selects 4 mA	
M E ▲ ▼	Enter	ACK	Momentary Acknowledge of new Set Point	
M E ▲ ▼	Mode	Calib	S.P. Function - Calib Adjust	
M E ▲ ▼	Down	CalibOut	S.P. Function - Output during Calibration Adjust	
M E ▲ ▼	Enter	Track	Use ▲ or ▼ keys to select Track, Zero, C1.50mA, C4.00mA or User mA	
			Track = Output during calibration tracks the calibration gas, Zero = Output is Zero during calibration, C1.50mA = Output during calibration is 1.50 mA, C4.00mA = Output during calibration is 4.0 mA	
M E ▲ ▼	Enter	*Track	* = Current selection	
M E ▲ ▼	Down	Tbl Out	S.P. Function - 4-20 mA Output during Trouble Adjust	
M E ▲ ▼	Enter	*T2.50mA	Use ▲ or ▼ keys to select 2.50 mA or User select	
M E ▲ ▼	Down	Dig Input	S.P. Function - Digital Input Adjust	
M E ▲ ▼	Enter	Sprvsd	Use ▲ or ▼ keys to select Supervised or Unsupervised Digital Input	
M E ▲ ▼	Down	Warm Min	S.P. Function - Warm Up Time Adjust	
M E ▲ ▼	Enter	Warm 1	Use ▲ or ▼ keys to select between 1 and 8 minutes warm up time	
RS-485 Adjustment Example				
M E ▲ ▼	Enter	Address	S.P. Function - RS-485 Address Adjust	*E
M E ▲ ▼	Enter	Addr:016	Use ▲ or ▼ keys to enter new address	
M E ▲ ▼	Enter	ACK	New address selected	
M E ▲ ▼	Enter	Address	S.P. Function - RS-485 Address Adjust	
M E ▲ ▼	Down	Baud	S.P. Function - RS-485 Baud Rate Adjust	
M E ▲ ▼	Enter	*38400	Press [E] to select or [▲] or [▼] to select another	

Table 4-3B Set-Up Configuration

4.5 MAINTENANCE FUNCTIONS

The maintenance menu enables the operator to view sensor and software versions. Sierra Monitor technical support has access to other values as needed. The maintenance menu operation is described in Table 4-4.

Key	Function	Display	Description	Reference
		XXXPPM	Default Display	
M E ▲ ▼	Mode	ALMRSET:	Mode Function - Alarm Reset	
M E ▲ ▼	Mode	CALIB:--	Mode Function - Calibrate	
M E ▲ ▼	Mode	SETUP:-	Mode Function - Set Point Adjustments	
M E ▲ ▼	Mode	MAINT:--	Mode Function - Maintenance	
M E ▲ ▼	Enter	Ver1.00aA	Module Software Version Number	
M E ▲ ▼	Enter	CCC001	Module Custom Configuration Control number	

Table 4-4
Maintenance Menu

5. CALIBRATION

5.1 CALIBRATION FREQUENCY

The 5100-99-IT has been calibrated in the factory prior to shipment. It is recommended that the user check calibration before placing in service. Periodic functional tests are advisable for critical applications and hostile environments.

The transmitter microprocessor software includes high level self checking algorithms which provide continuous diagnostic and self adjustment. Users may select calibration frequencies dependent upon sensor type.

5.2 CALIBRATION PREPARATION

Calibration of the transmitter with sensor is accomplished by simple menu based steps and application of span gas.

NOTE

If an error is made during any stage of the calibration process, hold the magnet stick at the Switch [M] for 10 seconds. A scrolling display will indicate "Calibration aborted" and the sensor module will exit the calibration activity and return to normal operating mode. The calibration procedure can then be restarted.

Calibration must be performed only when the area is known to be clear of the applicable toxic gas. If necessary, use a portable instrument to confirm that there is no background toxic gas.

5.2.1 CALIBRATION GAS DELIVERY METHODS

Calibration gas is can be delivered to the sensors via the following delivery devices:

Model 5358-00: Calibration Adapter - used with portable calibrators. See 5-1.

Model 5360-00: Calibration Gas Delivery fitting - permanently installed fitting which allows tubing to be run to a convenient delivery location

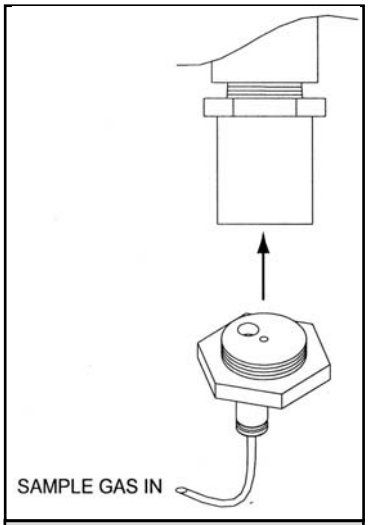


Figure 5-1
Model 5358-00 Calibration Adapter

5.3 CALIBRATION PROCEDURE

Table 5-1 shows the step by step process of the calibration procedure.

The procedures requires that the menu "keys" be activated using the magnet stick. Each key pressed steps through the process of setting the zero value for clean air and then setting the span value.

At each of these steps, apply calibration gas of the value corresponding to the setting accepted on the sensor module display.

5.3.1 SENSOR EXPOSURE TO GAS

Calibration gas must be delivered to the sensor using the flow rate and duration specified by the sensor manual.

Key	Function	Display	Description	Reference
		XXXPPM	Default Display	
M E ▲ ▼	Mode	ALMRSET:	Mode Function - Alarm Reset	
M E ▲ ▼	Mode	CALIB:--	Mode Function - Calibrate	
M E ▲ ▼	Enter	CAL-ZERO	Banner: Apply zero gas, enter <E> when done	
			Operation: Confirm area clear of gas, or apply zero air to sensor.	
M E ▲ ▼	Enter	ACK	Zero gas setting acknowledged	
		10PPM-SP	Banner: Select span, enter <E> to calibrate sensor Banner: (5100-03-IT) Specify Cal gas <E> when done	Sub A
M E ▲ ▼	Enter	C 4 PPM	Banner: Apply span gas, then enter <E> to calibrate gas sensor	Sub B
		C 4 PPM	*Operation: Apply calbration gas.*	
		CXXXPPM	*Operation: As gas is applied the reading will increase - wait 3 minutes*	
M E ▲ ▼	Enter	CAL-OK	Calibration Passed - now remove gas	
		WAIT-50	*Operation: Fifty second time out before sensor is returned to service.*	
Sub-Routines				
		10PPM-SP	Banner: Select span, enter <E> when done	Sub A
M E ▲ ▼	Up	25PPM-SP	*Operation: Change Span Gas Value to 25PPM*	
M E ▲ ▼	Up	Adj-SPAN	*Operation: User adjustable value*	
M E ▲ ▼	Enter	25PPM-SP	*Operation: Ready for user adjustment*	
M E ▲ ▼	Enter	C 25PPM	Banner: Apply 25PPM gas, then enter <E> to calibrate gas sensor	Sub B
		C 25PPM	*Operation: Apply calbration gas.*	
M E ▲ ▼	Enter	CAL-FAIL	*Operation: No calibration gas applied, or sensor did not respond correctly.*	
		WAIT-50	*Operation: Fifty second time out before sensor is returned to service.*	
M E ▲ ▼	Mode	(Any)	*Operation: Hold magnet over Mode Switch for ten senconds to abort calibration*	Sub C
			Banner: Calibration Aborted	
		XXXPPM	Default Display	

Table 5-1
Calibration

6. SERVICE

6.1 TRANSMITTER CONFIGURATION

The transmitter is comprised of the following sub-assemblies (Figure 6-1):

5100-99-IT	Transmitter
SPL21810	Aluminum Enclosure
SPL21823	316SS Enclosure
SPL21824	Transmitter Assembly

6.2 ENCLOSURE REPLACEMENT

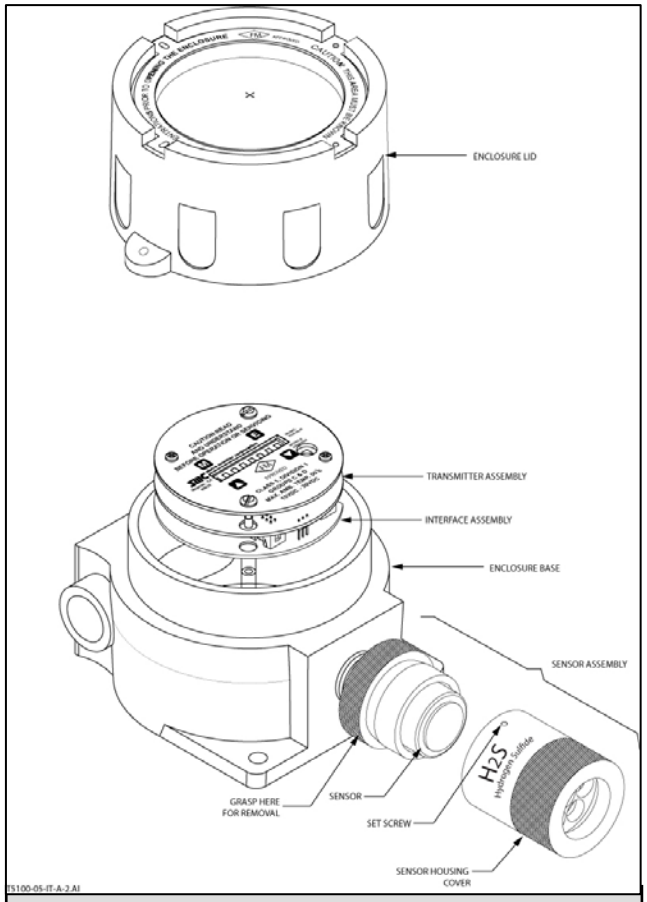


Figure 6-1
Transmitter Components

The enclosure should be replaced if the cover threads or conduit threads have been damaged, or if the enclosure has been damaged sufficiently that it no longer meets the required NEMA classification.

To replace the enclosure follow the transmitter removal instructions, remove the damaged enclosure from its conduit, install a new enclosure and replace the transmitter and sensor assembly.

NOTE: Refer to Appendix G for service information for the 5100-25-IT.

6.3 TRANSMITTER REPLACEMENT

The transmitter assembly should be replaced when it is determined that it is unreliable, noisy or cannot be adjusted for calibration. This may occur due to age, corrosion or failed components.

To replace the transmitter assembly:

a. Remove the cover of the main enclosure
b. Unscrew the two thumb screws in the top of the cover plate, lift the assembly and rotate 90^{o} to relieve the wiring service loop
c. Unplug the sensor connector from the transmitter
d. Plug connector into new transmitter (be sure to match numbers between connector and socket).
e. Restore power and allow a minimum of 3 hours for stabilization before re-calibration

6.4 INSTALLATION INSPECTION

Prior to system start-up or trouble shooting the entire system should be visually inspected. The following are guidelines for that inspection:

6.4.1.1 CONTROLLER INSTALLATION

- Controller installed in conformance to instruction manual recommendations.
- AC power is correctly grounded.
- Hot AC and relay connections have safety covers installed.

6.4.1.2 MOISTURE TRAPS AND RAINSHIELDS

- Conduit seals and drains installed to avoid moisture build up in electronics enclosure. Water accumulation in transmitter enclosures is a major cause of damage and system failures - take precautions to seal electrical conduits and provide moisture traps and drains to avoid water damage
- Rain-shields installed where applicable.

6.4.1.3 STANDARD VOLTAGES

- DC Voltage to be applied to the transmitter must be between 10 VDC and 30 VDC.

6.5 INSPECTION AND TROUBLESHOOTING GUIDE

This inspection and troubleshooting guide can be used to step through the system start-up and to determine the corrective action if a fault occurs.

6.5.1.1 IF TRANSMITTER DOES NOT RESPOND TO GAS

1. Repeat calibration procedure.
2. Remove the gas and wait for the timer to completely count down.
3. Apply calibration gas and verify that the sensor sees calibration gas after calibration.
4. If the sensor still does not see gas, power cycle the unit and repeat calibration.

6.5.1.2 IF THE TRANSMITTER DISPLAYS “STARTING” FOR MORE THAN 1 HOUR

1. Make sure the sensor is placed in an ambient room temperature environment.
2. Power cycle the sensor.
3. Ensure that the sensor is not exposed to the gas of interest during warm-up.

6.5.1.3 IF THE TRANSMITTER DOES NOT DISPLAY THE CORRECT PPM

1. Power cycle the unit
2. Recalibrate the sensor.

6.5.1.4 IF THE DISPLAY SHOWS ‘F’

1. Power down the unit
2. Open the enclosure and unplug the sensor assembly from the transmitter board.
3. Plug the sensor back into the transmitter board carefully and ensure a secure fit.
4. Power up the unit.

6.5.1.5 IF THE DISPLAY SHOWS ‘C’

1. Complete calibration and exit to operating mode.

6.5.1.6 IF THE DISPLAY SHOWS ‘S’

1. Check connections with Sentry Connections.

7. APPENDICES

APPENDIX A - SPECIFICATIONS

Output:

Display:	Fixed and Scrolling LED
Relays (Optional):	8 Amp, High Alarm, Low Alarm, 2 Amp Trouble all SPDT
Analog Output (Optional)	Analog 4-20 mA (Trouble 0 mA, Calibration 1.5 mA)
Signal Output:	Sentry bus Serial RS-485 Modbus RTU

Input:

Remote Alarm Reset:	Normally open digital input (supervised or non-supervised)
Digital Input	4-20 mA
Analog Input	

Electrical Data:

Power consumption:	2 watts
Connection type:	3 wire
Input voltage:	24 VDC nominal: 10-30VDC

Operating Range:

	5100-99-IT
Ambient Temp (^{o}F)	5 to 122 ^{o}F
Ambient Temp (^{o}C)	-15 to 50 ^{o}C
Relative Humidity	15 – 90%

Enclosure:

Material - Standard:	Polyester powder-coated, sand-cast, copper-free aluminum
Material - Stainless Steel Option:	316 Stainless Steel
Enclosure Hazardous Location Approvals:	FM, ATEX, CSA
Dimensions: (H x W x D)	5.28 x 4.9 x 4.76 inches Al & SS (10.56 x 9.8 x 9.52 cm)
Weight:	2.7 lb. (1.3 Kg) (standard Aluminum enclosure) 5.4 lb. (2.6 Kg) 316 Stainless Steel
Housing:	NEMA 4X

Electrical Classification

FM Approved:	Explosion proof, Class 1, Div. I, Groups B, C, D Class I, Zone 1, Groups IIB+H2 IP66

Modbus:

Baud:	38400 (Adjustable 2400 to 38400 Baud)
Parity:	None
Stop bit:	1
Data bits:	8
Flow Control:	None
Memory map:	Appendix E

Warranty: Limited Warranty 2 years

Specifications subject to change without notice

Ordering Information:

5100 -	**XX -**	**IT -**	**YY -**	**ZZ**
5100 Series	-99=4-20mA	- IT Series	- Al (Aluminum Enclosure) - SS (Stainless Steel)	- 01 Sentry, RS-485, 4-20mA, & Digital Input - 02 = Sentry, RS-485, 4-20mA, Digital Input & Relays

APPENDIX B: - MODEL NUMBERS & PARTS LIST

Transmitter	5100-99-IT-AL-01	4-20 mA Transmitter, AL
	5100-99-IT-AL-02	4-20 mA Transmitter, Relay, AL
	5100-99-IT-SS-01	4-20 mA Transmitter, SS
	5100-99-IT-SS-02	4-20 mA Transmitter, Relay, SS
Spare Parts	SPL21824	Transmitter
	SPL21810	Enclosure, Transmitter, Aluminum
	SPL21823	Enclosure Transmitter, 316SS
	SPL21825	Interface Board without Relay
	SPL21829	Interface Board with Relay

APPENDIX C: LIMITED WARRANTY

SIERRA MONITOR CORPORATION warrants its products to be free from defects in workmanship or material under normal use and service for two years after date of shipment. SMC will repair or replace without charge any equipment found to be defective during the warranty period. Final determination of the nature and responsibility for defective or damaged equipment will be made by SMC personnel.

All warranties hereunder are contingent upon proper use in the application for which the product was intended and do not cover products which have been modified or repaired without SMC approval or which have been subjected to accident, improper maintenance, installation or application, or on which original identification marks have been removed or altered. This Limited Warranty also will not apply to interconnecting cables or wires, consumables (ie. calibration gases, batteries, sensors), nor to any damage resulting from battery leakage.

In all cases SMC's responsibility and liability under this warranty shall be limited to the cost of the equipment. The purchaser must obtain shipping instructions for the prepaid return of any item under this warranty provision and compliance with such instruction shall be a condition of this warranty.

Except for the express warranty stated above, SMC disclaims all warranties with regard to the products sold hereunder including all implied warranties of merchantability and fitness and the express warranties stated herein are in lieu of all obligations or liabilities on the part of SMC for damages including, but not limited to, consequential damages arising out of/or in connection with the use or performance of the product

APPENDIX D: MODBUS MEMORY MAP

Read Register Table

Register	Description	Comments
40001	Concentration	Gas Concentration multiplied by 100
40002	Temperature	Temperature in degrees Celsius scaled by a factor of 100
40003	High Alarm Relay	Boolean indicating the High Alarm Status, 0 No Alarm, 1 High Alarm
40004	Low Alarm Relay	Boolean indicating the Low Alarm Status, 0 No Alarm, 1 Low Alarm
40005	Low Alarm Value	Low alarm set point, used for activating Alarms
40006	High Alarm Value	High alarm set point, used for activating High Alarms
40007	Reserved	
40008	Reserved	
40009	Reserved	
40010	Reserved	
40011	Trouble Bits	0 for no trouble
40012	Trouble	1 for any trouble, 0 for no trouble
40013	High Alarm Immediate	Like 40003, but never latched
40014	Low Alarm Immediate	Like 40004, but never latched
40015	Random ID	Randomly generated permanent ID of sensor
40016	Restart Count	
40017	Run time – high	In minutes
40018	Run time – low	In minutes
40019	Max. gas value	*scale (see 40024)
40020	Model	51005, 51003, 51004, 51006, etc
40021	Range	*scale (see 40024)
40022	Units	3 is PPM
40023	Temperature Units	0 is C, 1 is F
40024	Gas Scale	Value like 1 or 100
40025	Temperature Scale	Value like 1 or 100

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